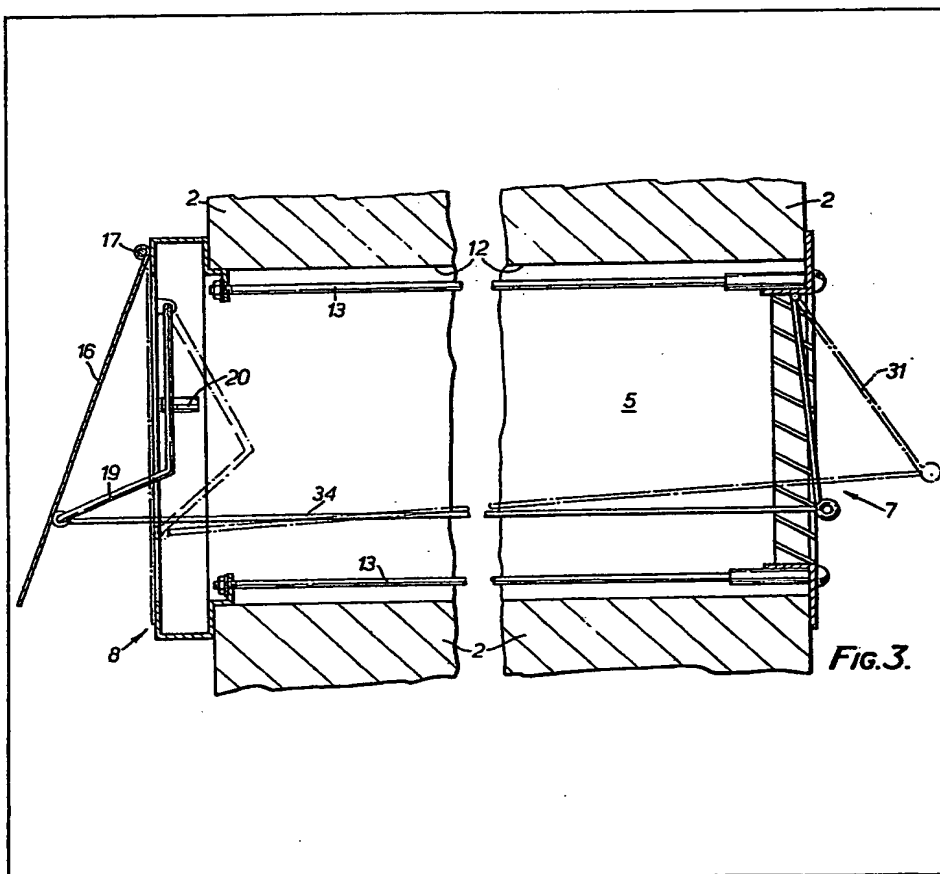


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 (71) Applicants  
 Ameco Limited,  
 Ameco House,  
 Bentalls,  
 Basildon,  
 Essex,  
 England.  
 (72) Inventors  
 Clarence George Hall,  
 Douglas Michael Venison.  
 (74) Agents  
 A.A. Thornton & Co.

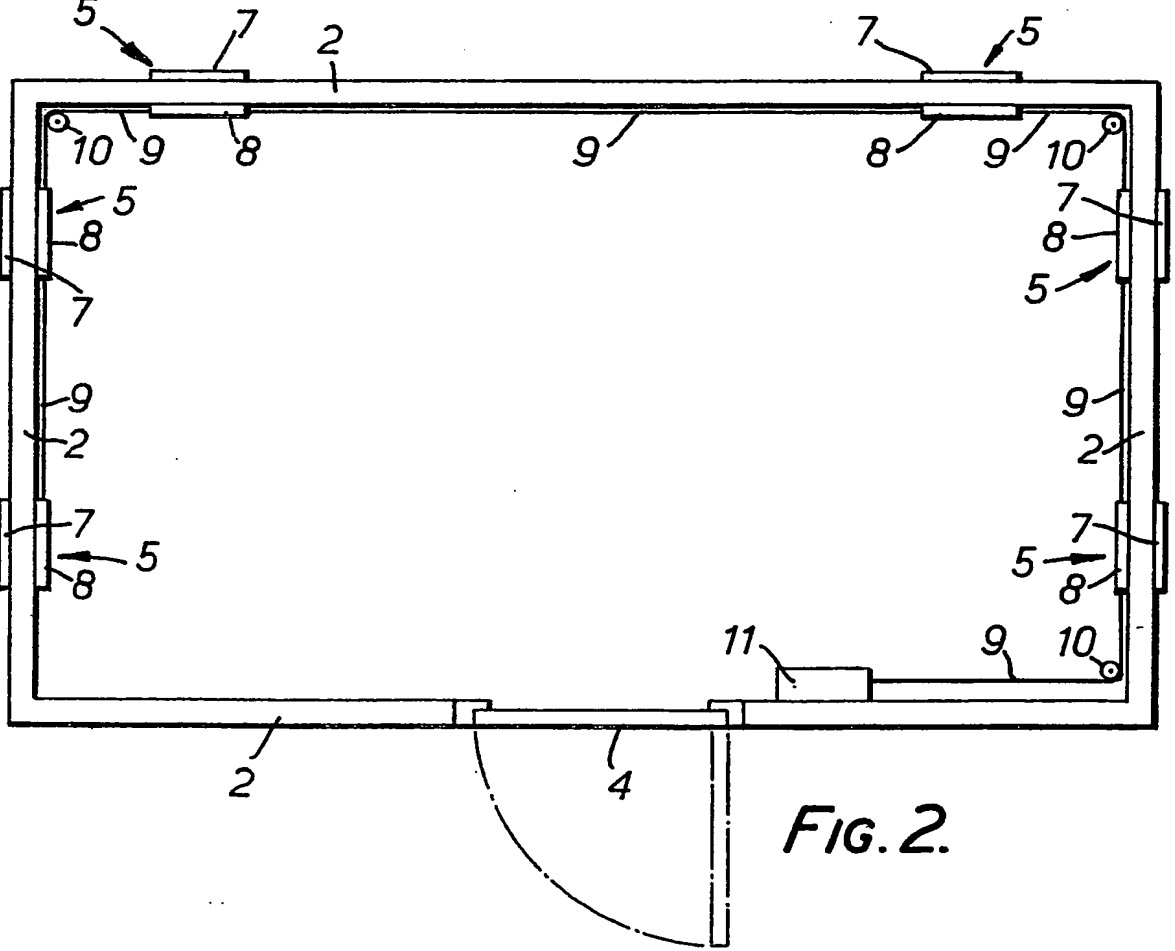
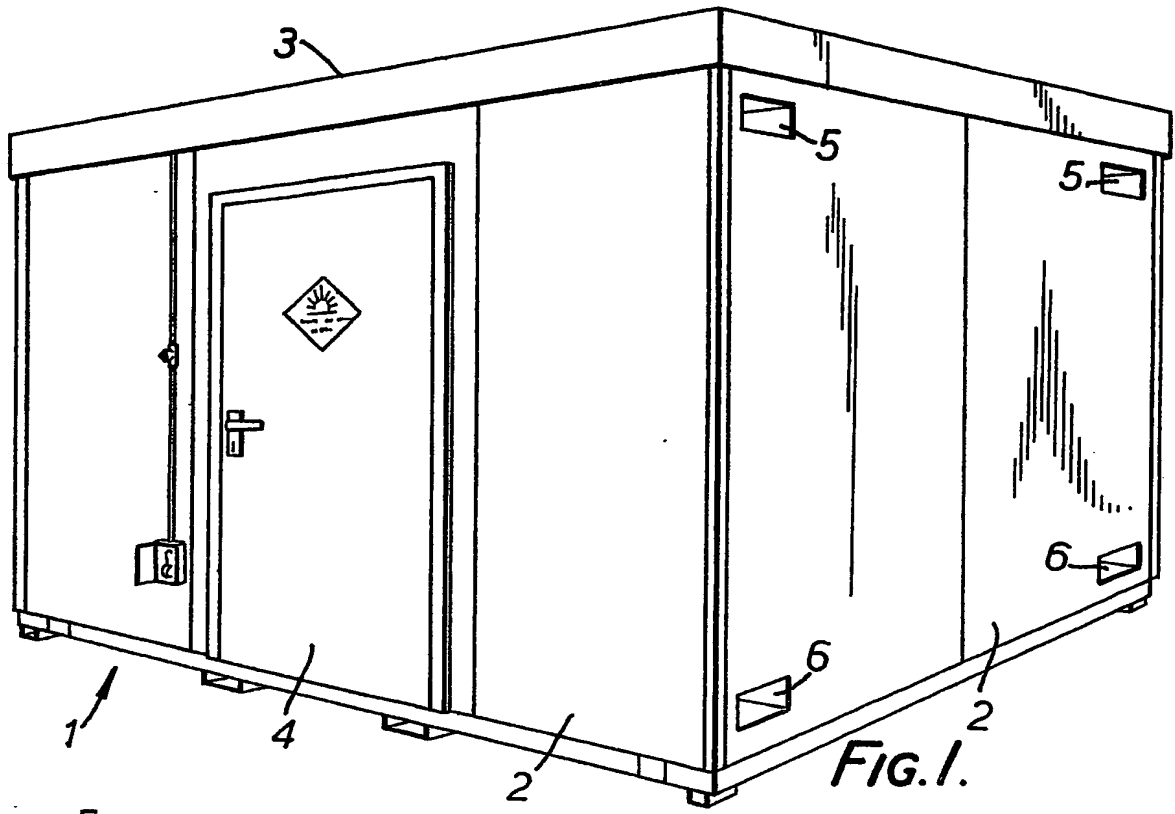
**(54) Self-closing vents and ventilation system**

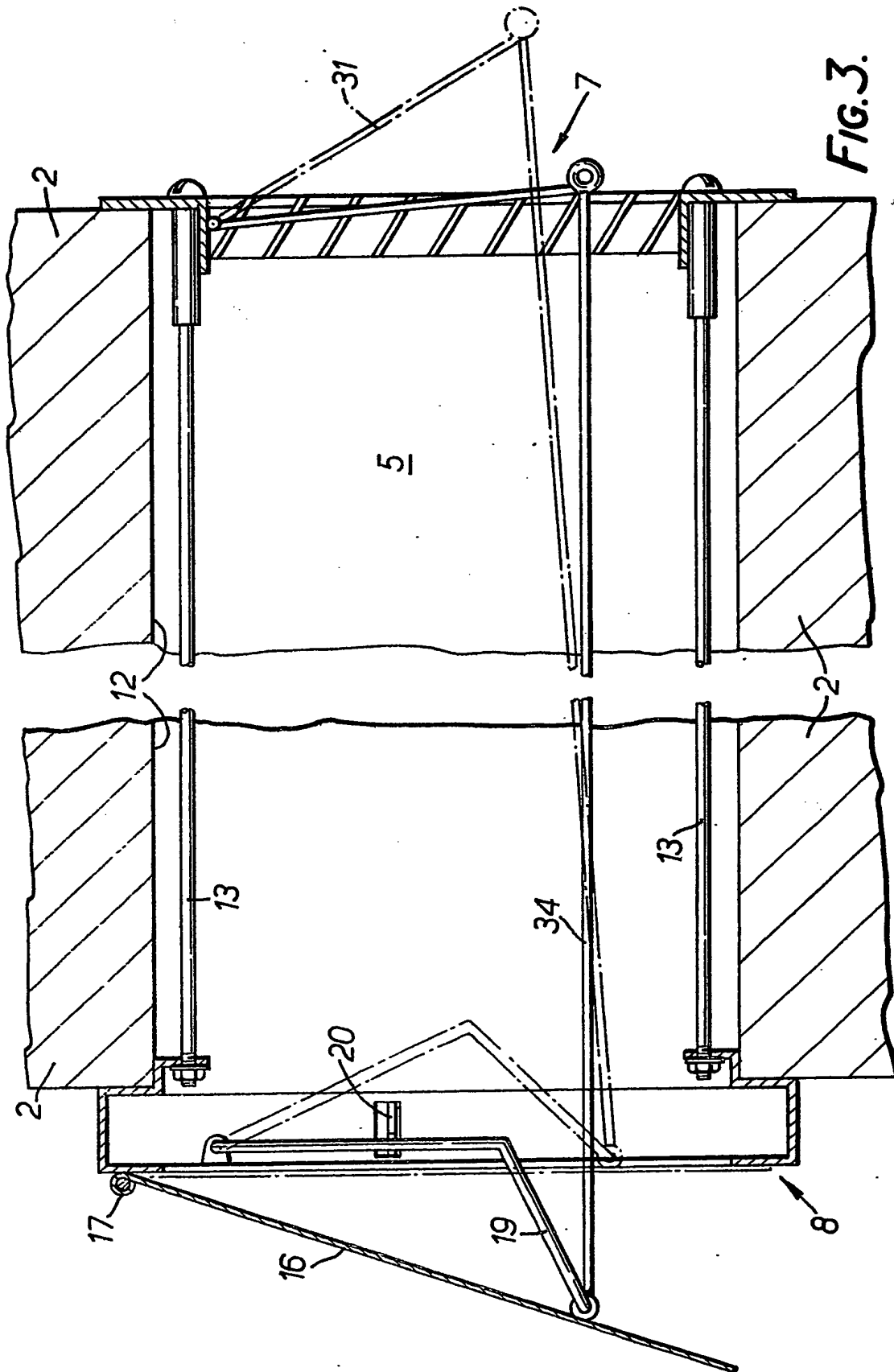
(57) A self-closing vent for use in the wall 2 of a hazardous goods store comprises a flap 16 which is biased into a closed position (as shown in broken lines in the drawing) and is held normally open against the spring bias by a frame 19 in order to permit natural ventilation of the store. The frame 19 is held in position by a latch 20 which is spring biased into an inoperative position in which the frame is released. The latch is normally held in an operative position against its spring bias by an operating cable which connects the vent to a fire sensor. When the fire sensor is triggered the cable is released and the latch 20 moves to its inoperative position permitting the vent to close. The fact that the vent is closed is indicated from the exterior of the building by a protruding flag 31.



The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

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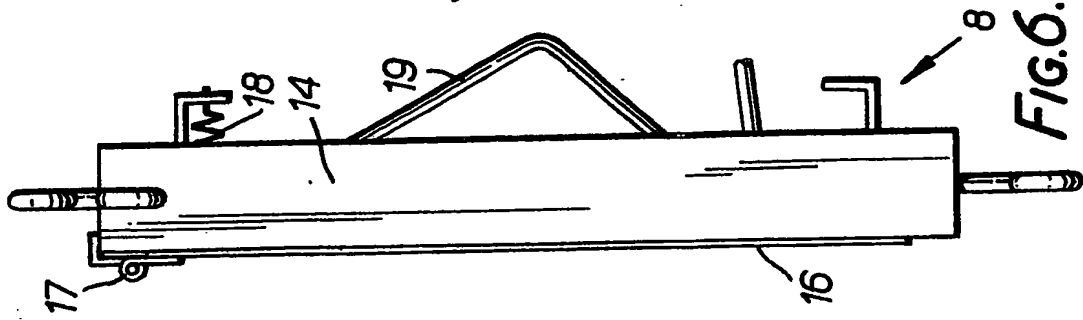


FIG. 6.

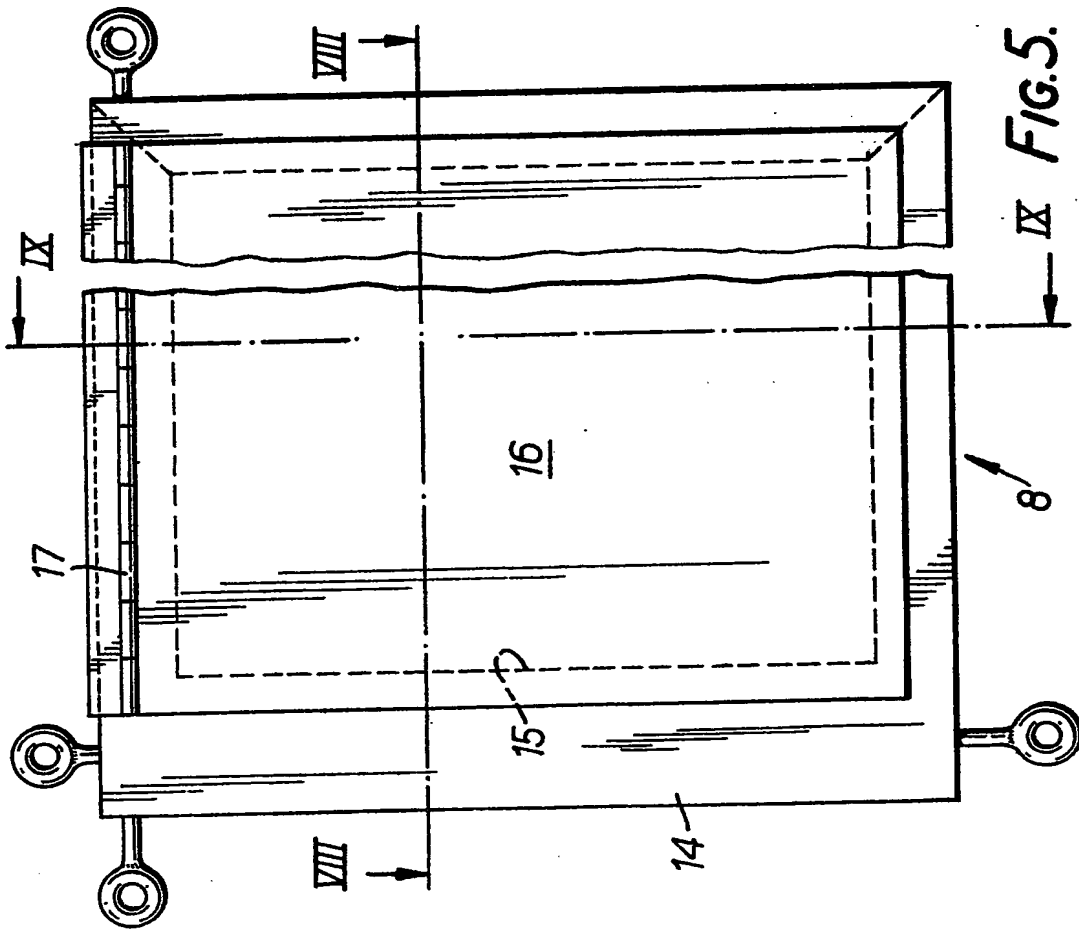


FIG. 5.

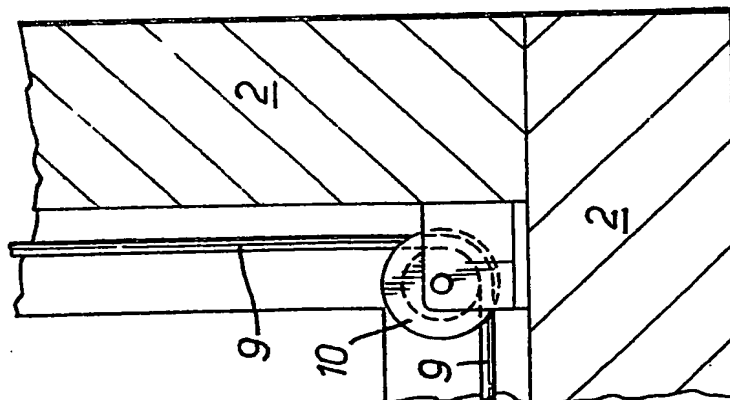


FIG. 4.

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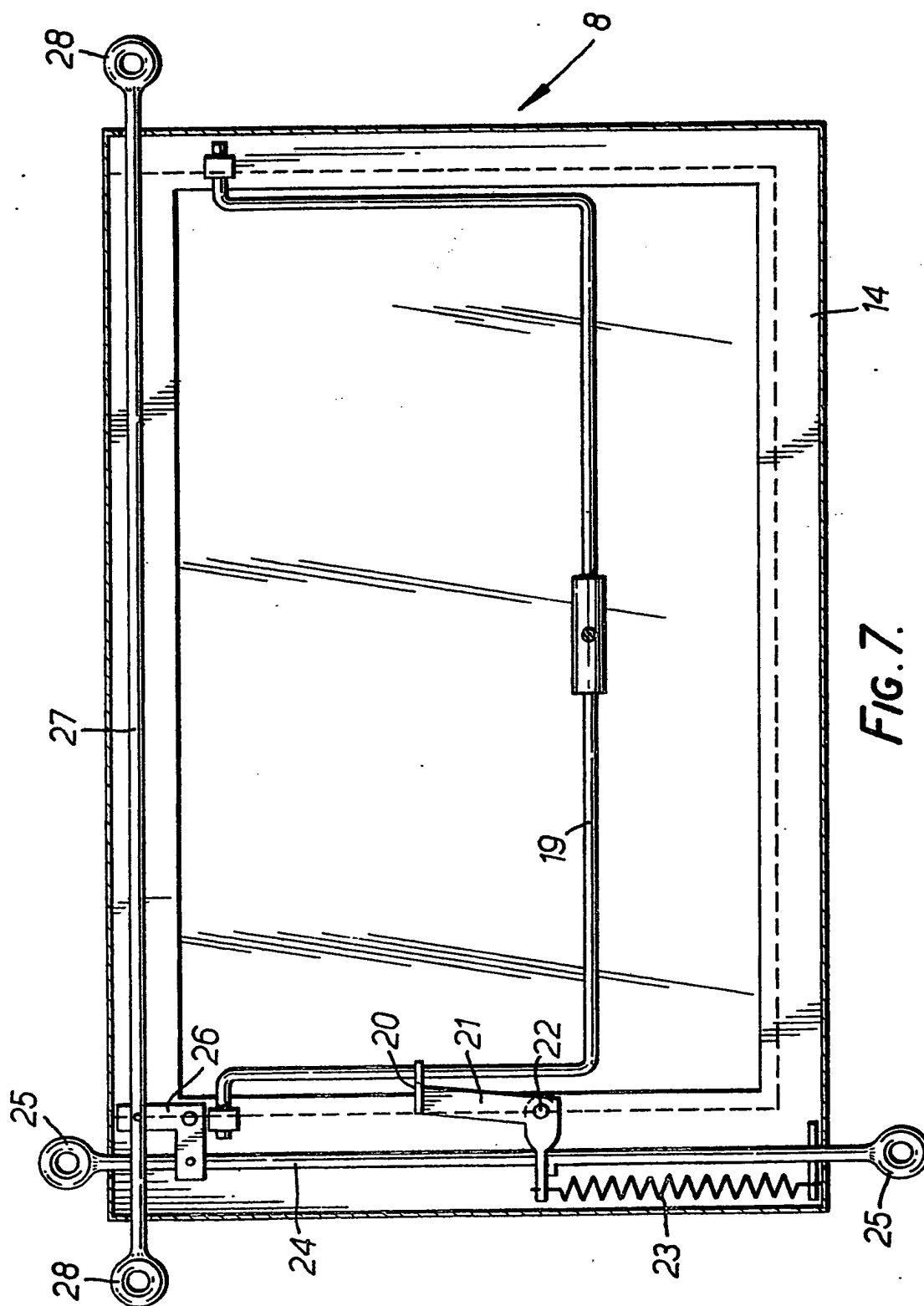


FIG. 7.

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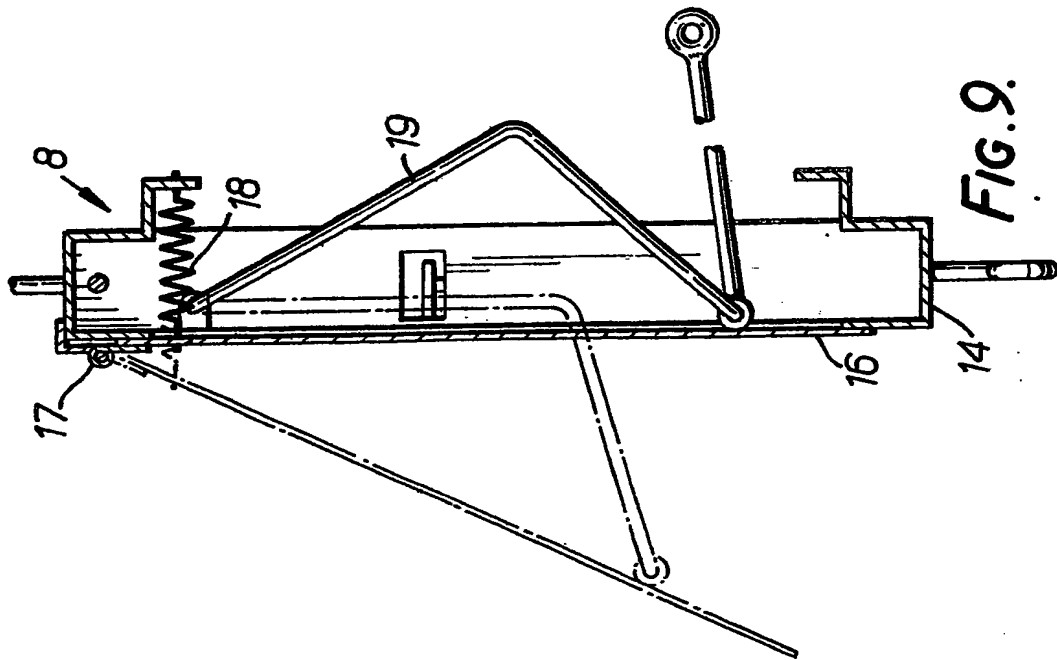


FIG. 9.

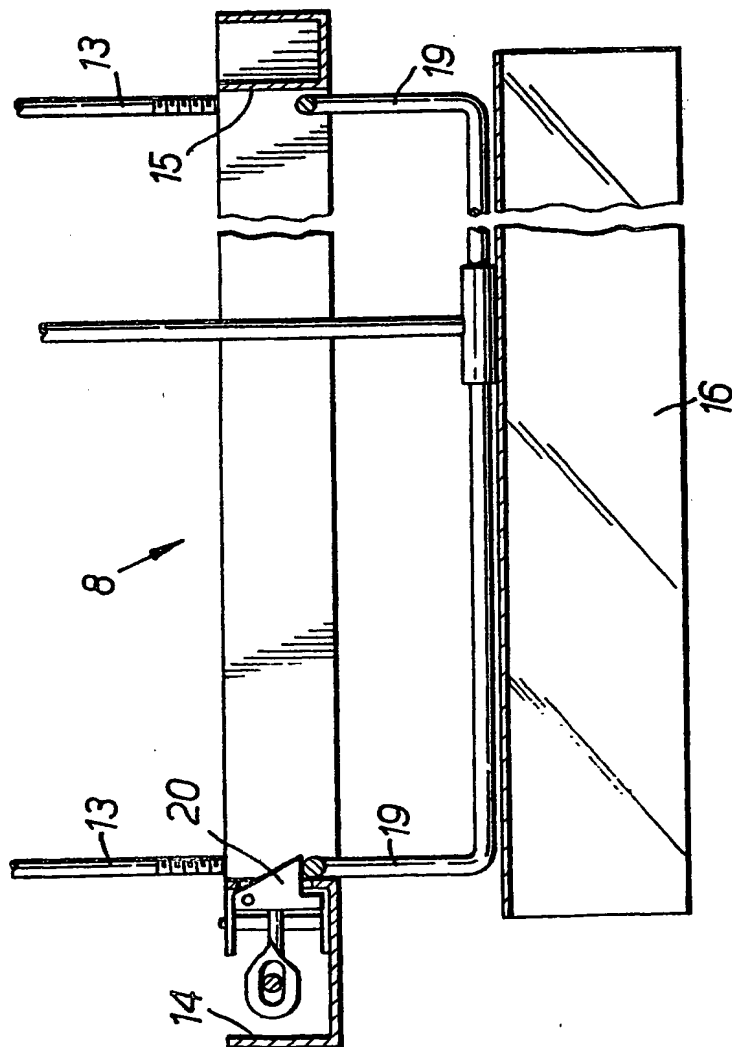


FIG. 8.

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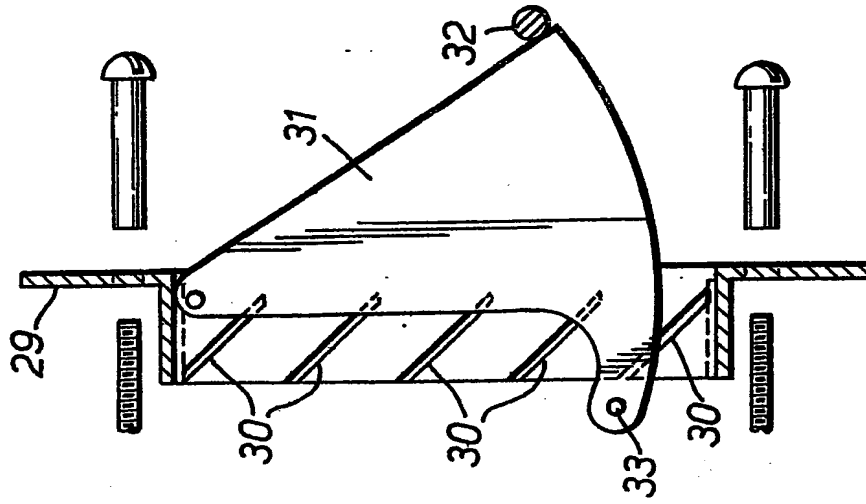


FIG. 11.

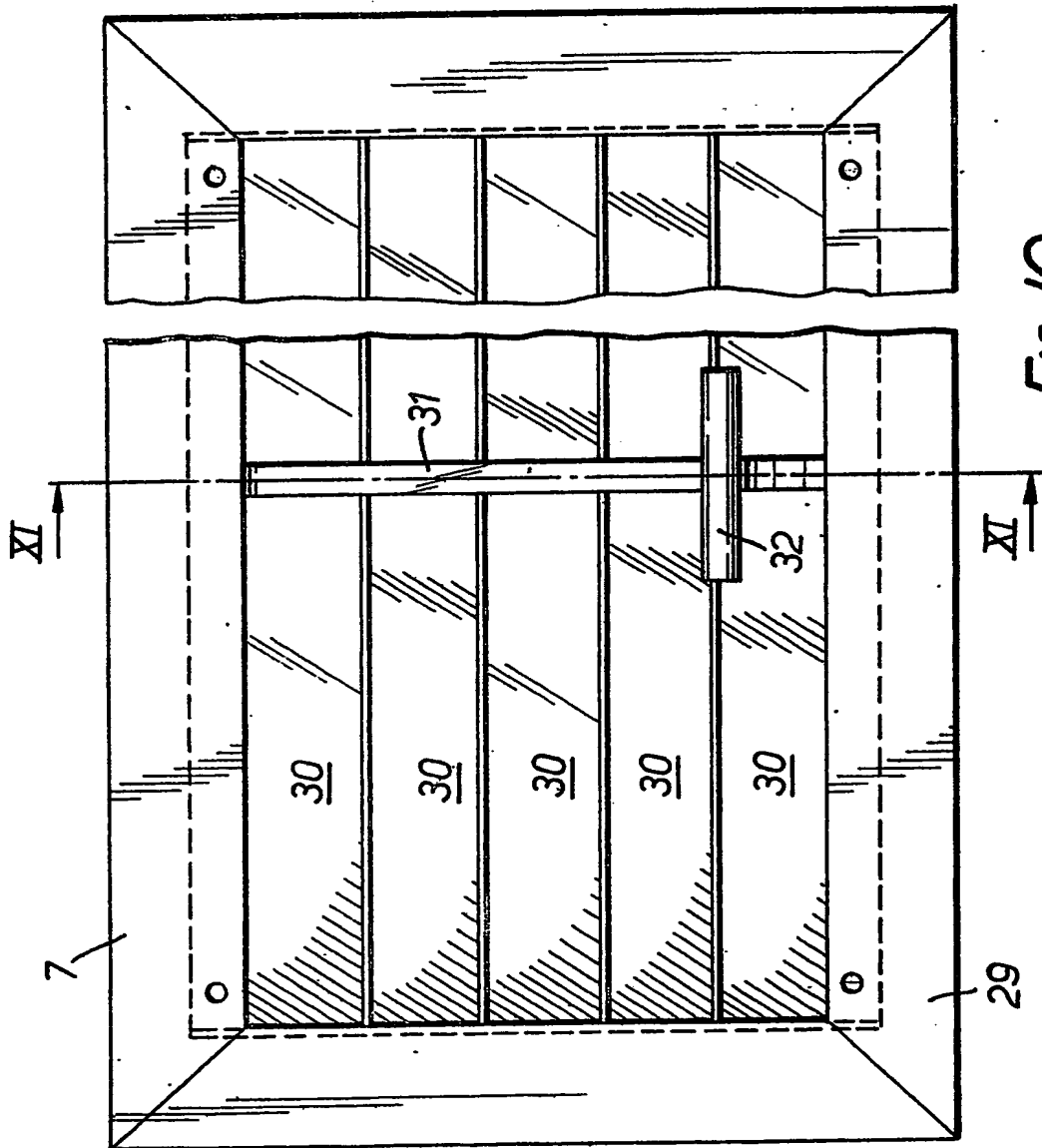


FIG. 10.

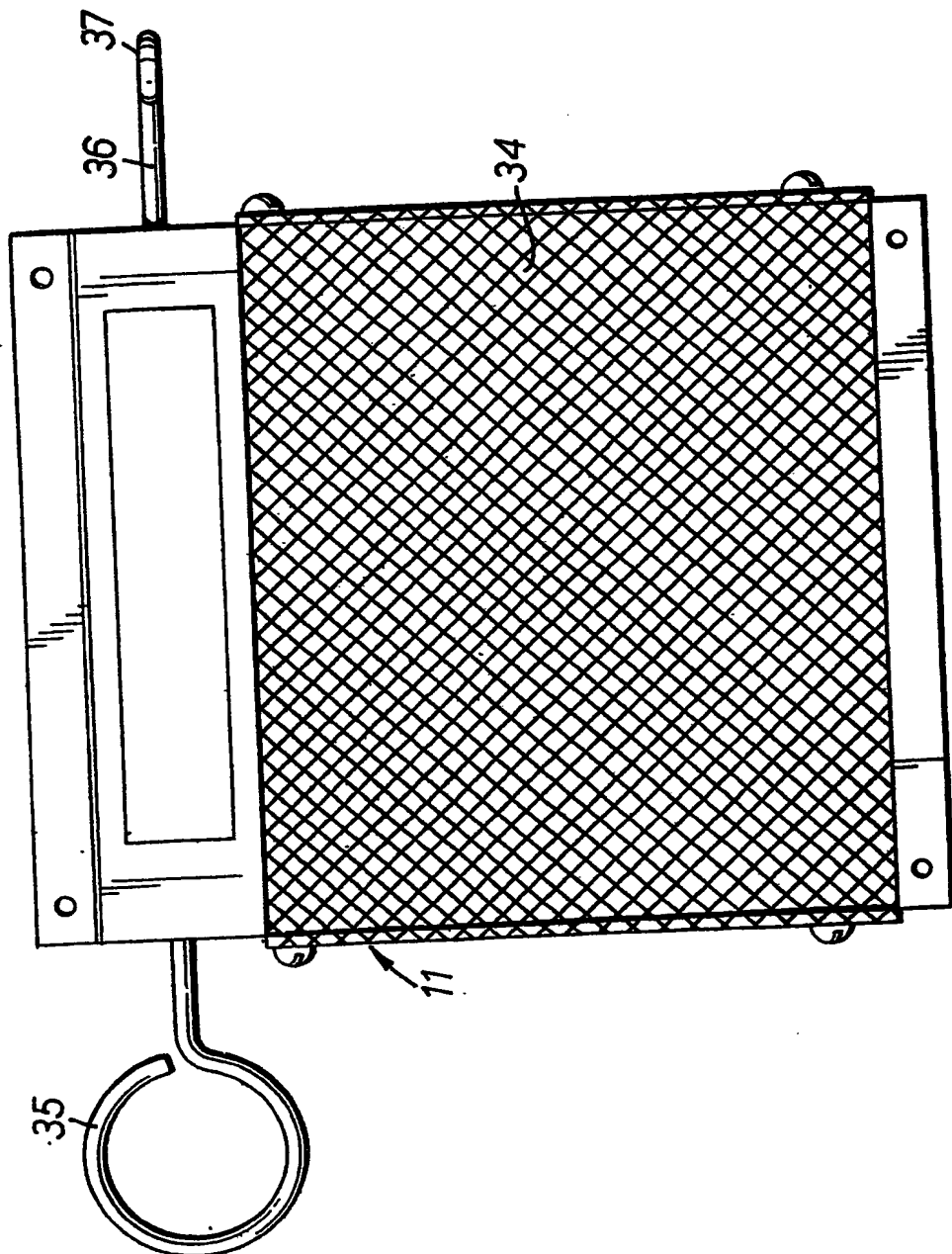


FIG. 12.



## SPECIFICATION

## Self-closing vents and ventilation system

5 This invention relates to self-closing vents and to a ventilating system incorporating some closing vents.

In various enclosures which are normally ventilated it is desirable to provide a ventilation system which is self-closing in the event of fire, particularly in the event of fire within the enclosure. For example, a hazardous goods store in which substances giving off explosive or inflammable vapours are stored should desirably be adequately ventilated to avoid the build-up of such vapours. However, in the event of fire within the store it is desirable that all the vents are closed in order to cut-off the supply of oxygen to the fire and contain the fire within the store.

20 According to one feature of the present invention there is provided a self-closing vent comprising a body defining a vent aperture; at least one flap for closing the vent aperture, the or each flap being biased towards a closed position in which the vent aperture is closed; latch means having an operative position for holding the or each flap in an open position, in which the vent aperture is open, against the closing bias; and means biasing the latch means into an inoperative position in which it does not hold the or each flap in the open position.

According to another feature of the invention there is provided a ventilation system comprising at least one self-closing vent according to the above feature of the invention; and fire sensitive means coupled to the or each latch means to maintain the or each latch means in its operative position until fire is detected and then permit the or each latch means to move to its inoperative position.

In an embodiment of ventilation system a plurality of self-closing vents are provided in spaced apart locations with the latch means interconnected by an operating cable. The operating cable terminates in a temperature sensor which maintains the cable under tension until the sensor is triggered, whereupon the cable is released allowing all the vents to close simultaneously.

The above and further features and advantages of the invention will become clear from the following description of an embodiment thereof, given by way of example only, reference being had to the accompanying drawings wherein:-

*Figure 1* is a perspective view of a portable hazardous goods store incorporating a ventilation system;

55 *Figure 2* is a plan view of the store of *Figure 1* illustrating the positions of the components of the ventilation system;

*Figure 3* is a section through the wall of the store of *Figure 1* in the region of a vent;

60 *Figure 4* is a plan view of the corner of the store of *Figure 1*;

*Figure 5* is an elevational view of a vent from inside the store with the vent closed;

*Figure 6* is an end view of a vent of *Figure 5*;

65 *Figure 7* is a view similar to *Figure 5* but with

portions broken away to reveal the interior of the vent;

*Figure 8* is a section on the line VIII-VIII of *Figure 5*;

*Figure 9* is a section on the line IX - IX of *Figure 5*;

70 *Figure 10* is a view of an external grill viewed from the outside of the store;

*Figure 11* is a section on a reduced scale along the line XI - XI of *Figure 10*; and

75 *Figure 12* is an elevational view of the fire sensor of the ventilation system of *Figure 2*.

The hazardous goods store 1 shown in *Figures 1* and 2 comprises a steel framework to which is secured a steel floor and steel walls 2. The store is provided with a roof 3 which is less strong than the walls and floor so that in the event of an explosion within the store the roof will tend to blow off. The roof may, for example, be fabricated from timber clad in a suitable waterproofing material. Access to the store is via a door 4 which is of suitable strength and is fire-resistant.

85 The store 1 is provided with a ventilation system comprising two high level ventilation passages 5 and two low level ventilation passages 6 in each of the side walls and the rear wall. The ventilation passages are normally open and permit natural air flow through the store.

Referring to *Figure 2* the position of the high level ventilation passages 5 in each wall is shown, the low level ventilation passages 6 of each wall being located vertically below the high level ventilation passages. Each ventilation passage is fitted with an exterior grill 7 and an interior vent 8, both of which are described in more detail hereinafter. The vents 8, are interconnected by operating cables 9 which run around the walls of the store at the level of the high level ventilation passages 5 and pass round pulley wheels 10 at the corners of the store. One end of the end operating cable is connected to a fire sensor 11 which exerts a pull on that cable which is in turn transmitted to the other operating cables to maintain all the operating cables under tension. In the event of the fire sensor 11 detecting the presence of a fire the tension on the end cable 9 is released thereby releasing the tension in the remaining cables as described in more detail hereinafter.

110 Referring to *Figure 3* a section through the wall 2 of the store in the region of a high level ventilating passage 5 is shown. The passage 5 is formed by an aperture 12 formed in the wall 2, the exterior grill 7 and vent 8 being located at opposite ends of the aperture and secured together by bolts 13 which pass through the aperture 6.

The structure of a vent 8 is shown in more detail in *Figures 5 - 9*, then being illustrated in its closed position in *Figures 5* and 6 and in its open position in *Figures 7, 8* and 9. The vent 8 comprises a body 14 which defines a vent aperture 15. A flap 16 is connected by a hinge 17 to the body 14 to be movable between the closed position illustrated in *Figures 5* and 6 and in solid line in *Figure 9* in which the flap closes the vent aperture 15, and an open position illustrated in *Figures 3* and 8 and in broken line in *Figure 9* in which the vent aperture 15 is open to fluid flow. A spring 18 biases the flap 16 towards the closed position, and in normal use the flap is

held open against the bias of spring 18 by means of a frame 19 pivotally mounted on the body 14 and a latch 20 which engages one arm of the frame 19. When the latch 20 is released it moves out of contact with the frame 19 and the flap is closed by the action of spring 18.

Referring to Figures 7 and 8 the latch 20 is located at one end of a generally L-shaped lever 21 which is pivotally mounted for movement about a pivot axis 22 to move the latch 20 between an operative position, as shown in Figure 8, in which the latch engages the frame 19 to hold the flap 16 open, and an inoperative position in which the latch is withdrawn to permit the flap 16 to close under the influence of spring 18. A spring 23 is secured between the end of the lever 21 remote from the latch 20 and the body 14 to bias the lever anti-clockwise as viewed in Figure 7, i.e., to bias the latch 20 into its inoperative position.

The lever 21 is coupled to an axially movable rod 24 at a point intermediate the pivot axis 22 and the end of the lever remote from the latch 20. The rod 24 is formed with a connecting eye 25 at each end, and adjacent its upper end (as viewed in Figure 7) is pivotally connected to a bell crank lever 26. The other end of the lever 26 is pivotally connected to a generally horizontal rod 27 provided with connecting eyes 28 at its ends. Thus, an upward force applied to the rod 24 or a horizontal force towards the right applied to rod 27 (both as viewed in Figure 7) will hold the lever 21 in the position illustrated in Figure 7 against the biasing spring 23, and will thus maintain the latch 20 in its operative position. When the force is released the spring 23 will rotate the lever 21 anti-clockwise as viewed in Figure 7, moving the latch 20 to its inoperative position, and moving the rod 24 downward and the rod 27 towards the left.

In use, cables 9 interconnect the eyes 28 of adjacent vents, and vertical cables (not shown) connect the eye 25 at the bottom of the upper vent to the eye 25 at the top of the lower vent. Whilst tension is maintained on the end cable by the fire sensor 11 all the flaps will remain open. As soon as the tension is released all the rods can simultaneously move permitting the springs 23 to move the latches to the inoperative position, in turn permitting the springs 18 to close the flaps. The consequent downward movement of the rods 24 permits the closure of the lower flaps.

Referring now to Figures 10 and 11 an external grill 7 is shown in more detail. The grill 7 comprises a frame 29 in which are mounted a plurality of louvre slats 30. A central gap is provided in the louvre slats 30 in which is provided an indicator flag 31 pivotally mounted on frame 29. The indicator flag is provided with a fixed bar 32 at its outer end, and a pivotal connection 33 at its inner end. The pivotal connection 33 is connected to the frame 19 of the vent 8 by a connecting rod 34. Thus, when the flap 16 of a vent 8 is in the open position the corresponding indicator flag 31 will be located substantially within the wall aperture 5 and only the outer edge of the flag 31 and the bar 32 will be visible from the exterior of the store. However, if a flap 16 of a vent moves to its closed position the rod 34 will move the correspond-

ing indicator flag outwardly to the position shown in Figure 11. Thus, the position of the indicator flag 31 provides a visual indication from the exterior of the store as to whether or not the corresponding interior vent 8 is open or closed.

It will be noted that in the event of the vents 8 being closed resetting the fire sensor 11 to re-tension the cables 9 will not re-open the flaps. After re-tensioning the cables 9 the flaps 16 are re-opened by pushing the corresponding indicator flag 30 inwardly, thereby rotating the flap 16 and frame 19 until the frame latches on the latch 20. It should also be noted that if after closure of a vent 8 the flag 31 is pushed inwardly before the cables 9 are re-tensioned, the flap 16 will be opened, but will immediately close as soon as the corresponding interfit flag 31 is released.

Finally, referring to Figure 12 the fire sensor 11 is shown in more detail. The sensor 11 comprises a casing having an apertured portion 34 in which are housed two bi-metallic strips. One strip is thermally insulated whilst the other is exposed directly to the air of the store. A latch is mounted between the bi-metallic strips and holds in place an operating lever connected to a manually graspable ring 35. The other end of the operating lever is connected via a tension spring to a rod 36 the end of which is formed with a connecting eye 37 to which the end of the endmost cable 9 is attached. In the event of a rapid rise in temperature in the store the un-insulated bi-metallic strip will bend more rapidly than the insulated strip, thereby releasing the latch which in turn releases the operating lever and permits the rod 36 to move to the right as viewed in Figure 12 to release the tension in the cables 9. If the temperature in the store rises slowly both strips will move together until a pre-set limiting temperature is reached whereupon the latch will be released. Accordingly, the sensor 11 serves to close the vents 8 in the event either of a rapid rise in temperature or in the event of an excess temperature within the store.

Preferably, the store is provided with a pressure relieving vent coupled to the door lock in such a manner that the door cannot be unlocked until the pressure relieving vent has been opened. Accordingly, if all the vents 8 are closed and overpressure builds up within the store this pressure will be vented before the door can be opened.

The sensor 11 can, if desired, incorporate a switch to provide a remote indication of a fire within the store.

Although the vents 8 have been described as having the flap hinge 17 towards the top, they may if desired be mounted with the hinge adjacent the bottom, the preferred orientation of the vents being determined by whether they are to act as an inlet or an outlet.

## 125 CLAIMS

1. A self-closing vent comprising a body defining a vent aperture; at least one flap for closing the vent aperture, the or each flap being biased toward a closed position in which the vent aperture is closed;

latch means having an operative position for holding the or each flap in an open position, in which the vent aperture is open, against the closing bias; and means biasing the latch means into an inoperative position in which it does not hold the or each flap in the open position.

2. A self-closing vent according to claim 1 wherein the or each flap is spring biased towards the closed position, and wherein a frame is provided to bear against the or each flap to hold the or each flap in the open position, the frame being held by the latch means in position to hold the or each flap in the open position.

3. A self-closing vent according to claim 1 or claim 2 wherein the body is generally rectangular and the latch means is located adjacent one side of the body.

4. A self-closing vent according to claim 3 wherein a first operating member is coupled to the latch means and extends along said one side of the body, the arrangement being such that tension applied to one end of the first operating member maintains the latch means in its operative position.

5. A self-closing vent according to claim 4 wherein a second operating member is coupled to the first operating member and extends along one of the sides of the body adjoining the said one side, the arrangement being such that tension applied to one end of the second operating member is transmitted to the first operating member and maintains the latch means in its operative position.

6. A self-closing vent according to claim 4 or claim 5 wherein the or each operating member terminates in means for connection to an operating cable.

7. A self-closing vent according to any preceding claim including a grill spaced from said body and indicator means visible from the side of the grill remote from the body for indicating whether the or each flap is in the open position or the closed position.

8. A self-closing vent according to claim 7 wherein the indicator means comprise a flag coupled to the or each flap by a rod.

9. A self-closing vent according to claim 7 or claim 8 wherein after the or each flap has closed following movement of the latch means to its inoperative position, the or each flap can be re-latched in the open position by re-setting the latch means in its operative position and manually moving the indicator means to re-open the or each flap.

10. A self-closing vent, substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

11. A ventilation system comprising at least one vent according to any preceding claim, and fire sensitive means coupled to the or each latch means to maintain the or each latch means in its operative position until fire is detected and then to permit the or each latch means to move to its inoperative position.

12. A ventilation system according to claim 11 when appendant to claim 6 wherein a plurality of vents are provided, each vent being coupled to the or each adjacent vent by a respective cable con-

nected to the connection means, one of the vents being connected to the fire sensitive means by a further cable connected to the connection means of that vent.

13. A ventilation system, substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

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